CLAIMS

We Claim:

1. A spatial light modulator used in a display system for producing a color image by modulating a light beam having a multiplicity of sequential components of different frequencies, the spatial light modulator comprising:

a semiconductor substrate having a first photo-detector having a preferential spectral response to a first component of the multiplicity of components of the light beam and generating a timing signal according to which the spatial light modulator modulates the light beam.

2. The spatial light modulator of claim 1, wherein the semiconductor substrate further comprises:

a second photo-detector having a preferential response to a second component of the multiplicity of components of the light beam and generating another timing signal.

3. The spatial light modulator of claim 2, wherein the first and the second photo-detectors are positioned at different locations.

4. The spatial light modulator of claim 1, wherein the first photo-detector comprises a color filtering film that passes the first component of the light beam and blocks the other components of the light beam.

5. The spatial light modulator of claim 3, wherein the color filtering film comprises a polyimide or dye or polymer.

6. The spatial light modulator of claim 3, wherein the color filtering film comprises a dichroic filter stack.

7. The spatial light modulator of claim 4, wherein the color filtering film comprises a plurality of optical layers of different optical properties.

8. The spatial light modulator of claim 3, wherein the semiconductor substrate further comprises:

a third photo-detector having a preferential spectral response to the light beam and generating a another timing signal; and

a differential amplifier in connection with the first and the third detectors for subtracting the timing signals from the first and third photo-detector and amplifying the difference between said timing signals.

9. The spatial light modulator of claim 4, wherein the timing signals from the first and third photo-detector co-exist during a particular time period.

10. The spatial light modulator of claim 1, wherein the semiconductor substrate further comprises:

an array of micromirrors for reflecting the light beam into different directions; and

an array of electrodes and circuitry for electrically deforming the micromirrors.

11. The spatial light modulator of claim 1, further comprising:

a glass substrate having an array of micromirrors formed thereon for reflecting the light beam into different directions; and

wherein the semiconductor substrate further comprises:

an array of electrodes and circuitry for electrically deforming the micromirrors of the array on the glass substrate.

12. The spatial light modulator of claim 11, wherein the semiconductor and glass substrates are bonded together.

13. A spatial light modulator, comprising:

an array of micromirrors for reflecting a light beam into different directions;

an array of electrodes and circuitry for deflecting the micromirrors; and

a photo-detector having a preferential spectral response to a component of the light beam with a particular frequency and generating a timing signal according to the detection for controlling the electrodes and circuitry.

14. The spatial light modulator of claim 13, wherein the array of the micromirrors is disposed on a substrate that is transmissive to visible light, and the array of electrode and circuitry are disposed on another substrate on which the photo-detector is disposed.

15. The spatial light modulator of claim 13, wherein the array of micromirrors, the array of electrode and circuitry and the photo-detector are disposed on the same substrate.

16. The spatial light modulator of claim 13, further comprising:

a package substrate on which the micromirror array, electrode and circuitry array and the photo-detector are placed.

17. The spatial light modulator of claim 16, further comprising: a package cover on the package substrate and hermetically sealed to the package substrate.

18. The spatial light modulator of claim 17, wherein the package cover is glass that is transmissive to visible light.

19. The spatial light modulator of claim 13, wherein the photo-detector further comprises: a color filtering film that passes the light component of the particular frequency and blocks other components of the incident light.

20. The spatial light modulator of claim 19, wherein the color filtering film comprises polyimide or dye or polymer.

21. The spatial light modulator of claim 19, wherein the color filtering film comprises a dichroic filter comprising multiple optical layers of different optical properties.

22. The spatial light modulator of claim 13, further comprising:

another photo-detector having a preferential spectral response different from that of the first photo-detector; and

a differential amplifier in connection to the photo-detectors to subtract the outputs of the photo-detectors and amplify a difference between the outputs.

23. The spatial light modulator of claim 13, further comprising:

another photo-detector;

wherein the incident light comprises a first and second component of different frequencies, the first and second components sequentially impinging the micromirror array;

wherein the photo-detector has a preferential spectral response to the first component of the incident light beam and generating a first timing signal corresponding to an arrival of the first component; and

wherein said another photo-detector has a preferential spectral response to the second component of the incident light generating a second timing signal corresponding to an arrival of the second component.

24. The spatial light modulator of claim 21, wherein the first and second timing signals co-exist during a particular time period.

25. A projector, comprising:

a light source;

a collection lens that collects light from the light source and focuses the collected light onto a spatial light modulator, wherein the spatial light modulator further comprises:

an array of micromirrors for reflecting light from the collection lens either away from or onto a projection lens;

an array of electrodes and circuitry for deflecting the micromirrors; and

a photo-detector having a preferential spectral response to a component of the incident light beam with a particular frequency and generating a timing signal according to the spectral response for controlling the electrodes and circuitry; and

a projection lens positioned to collect the reflected light from the micromirrors and project the collected light onto a display target.

26. The projector of claim 25, wherein the array of the micromirrors is disposed on a substrate that is transmissive to visible light, and the array of electrode and circuitry are disposed on another substrate on which the photo-detector is disposed.

27. The projector of claim 25, wherein the array of micromirrors, the array of electrode and circuitry and the photo-detector are disposed on the same substrate.

28. The projector of claim 25, further comprising:

a package substrate on which the micromirror array, electrode and circuitry array and the photo-detector are placed.

29. The projector of claim 28, further comprising: a package cover on the package substrate and hermetically sealed to the package substrate.

30. The projector of claim 29, wherein the package cover is glass that is transmissive to visible light.

31. The projector of claim 30, wherein the photo-detector further comprises: a color filtering film that passes the light component of the particular frequency and blocks other components of the incident light.

32. The projector of claim 31, wherein the color filtering film comprises polyimide or dye or polymer.

33. The projector of claim 31, wherein the color filtering film comprises a dichroic filter comprising multiple optical layers of different optical properties.

34. The projector of claim 25, further comprising:

another photo-detector having a preferential spectral response to all components of the incident light beam; and

a differential amplifier in connection to the photo-detectors to differentiate the responses of the photo-detectors and amplifies a difference between the detections.

35. The projector of claim 25, further comprising:

another photo-detector;

wherein the incident light comprises a first and second component of different frequencies, the first and second components sequentially impinging the micromirror array;

wherein the photo-detector has a preferential spectral response to the first component of the incident light beam and generating a first timing signal corresponding to an arrival of the first component; and

wherein said another photo-detector has a preferential spectral response to the second component of the incident light beam generating a second timing signal corresponding to an arrival of the second component.

36. The projector of claim 33, wherein the first and second timing signals co-exist during a particular time period.

37. A method for operating a spatial light modulator, comprising:

projecting a light beam onto the spatial light modulator through a collection lens;

detecting a component of the light beam with a particular frequency exiting from the collection lens;

generating a timing signal according to the detection; and

controlling the spatial light modulator in modulating the light beam based on the timing signal.

38. The method of claim 37, further comprising:

detecting another component of the light beam with another particular frequency; and

generating another timing signal.

39. The method of claim 38, further comprising:

subtracting the timing signals; and

amplifying the subtraction.

40. A display system, comprising:

a light source;

a collection lens that collects a light beam from the light source and focusing the collected light beam onto a spatial light modulator;

the spatial light modulator that modulates the incident light beam;

a photo-detector having a preferential spectral response to a component of the light beam with a particular frequency and generating a timing signal according to the response for controlling the modulation of the spatial light modulator; and

a projection lens for collecting the modulated light beam and projecting the collected light beam onto a display target.

41. The projector of claim 40, wherein the array of the micromirrors is disposed on a substrate that is transmissive to visible light, and the array of electrode and circuitry are disposed on another substrate on which the photo-detector is disposed.

42. The projector of claim 40, wherein the array of micromirrors, the array of electrode and circuitry and the photo-detector are disposed on the same substrate.

43. The projector of claim 40, further comprising:

a package substrate on which the micromirror array, electrode and circuitry array and the photo-detector are placed.

44. The projector of claim 40, wherein the photo-detector further comprises: a color filtering film that passes the light component of the particular frequency and blocks other components of the incident light.

45. The projector of claim 44, wherein the color filtering film comprises polyimide or dye or polymer.

46. The projector of claim 44, wherein the color filtering film comprises a dichroic filter comprising multiple optical layers of different optical properties.

47. The projector of claim 40, further comprising:

another photo-detector having a preferential spectral response to the incident light beam; and

a differential amplifier in connection to the photo-detectors to differentiate the detections of the photo-detectors and amplifies a difference between the detections.

48. The projector of claim 40, further comprising:

another photo-detector;

wherein the incident light comprises a first and second component of different frequencies, the first and second components sequentially impinging the micromirror array;

wherein the photo-detector has a preferential spectral response to the first component of the incident light and generating a first timing signal corresponding to an arrival of the first component; and

wherein said another photo-detector has a preferential spectral response to the second component of the incident light generating a second timing signal corresponding to an arrival of the second component.

49. The projector of claim 48, wherein the first timing signal and the second timing signal co-exist for a particular time period.